MONTHLY WEATHER REVIEW.

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INTRODUCTION.

This REVIEW contains a general summary of the meteorological conditions which prevailed over the United States during June, 1884, based upon the reports from the regular and voluntary observers of the Signal Service and from co-operating state weather services.

Descriptions of the storms which occurred over the north Atlantic ocean during the month are also given and their approximate paths shown on chart i.

Under "areas of low barometer" are described six atmospheric depressions, all of which were of slight energy. The average number of areas of low barometer for the month of June during the last eleven years is nine—thus showing June, 1884, to have been less stormy than usual.

The most noteworthy meteorological feature of the month was the precipitation in California, where the June normal for the state is less than .10 inch, the average for June, 1884, being more than ten times as great. The monthly precipitation was also largely in excess of the average in the southern states east of the Mississippi river, while there was a marked deficiency in the states from Dakota and Nebraska, eastward.

The mean temperature of the month was below the average for June over the southern portions of the country, by from 1° to 6°; and over the northern portions it was above the average, the excess about corresponding with the deficiencies which occurred in the southern sections.

The local storms occurring during the month were numerous and severe; they were generally accompanied by very heavy rains, which resulted in much damage to agricultural and other interests.

The weather over the north Atlantic ocean during June was generally fine, the month passing without the occurrence of severe storms.

In the preparation of this REVIEW the following data, received up to July 20th, 1884, have been used, viz.: the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and twenty-two Signal Service stations and fifteen Canadian stations, as telegraphed to this office; one hundred and sixty-eight monthly journals, and one hundred and fifty-four monthly means from the former, and fifteen monthly means from the latter; two hundred and fifty-eight monthly registers from voluntary observers; forty-three monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports, through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs, furnished by the publishers of "The New York Maritime Register;" monthly weather reports from the local weather services of Alabama, Illinois, Louisiana, Missouri, Ohio, and Tennessee, and of the Central Pacific railway company; trustworthy newspaper extracts; and special reports.

ATMOSPHERIC PRESSURE.

[*Expressed in inches and hundredths.*]

The mean atmospheric pressure for June, 1884, determined from the tri-daily telegraphic observations of the Signal Service, is exhibited by the isobarometric lines on chart ii. This chart shows the mean pressure for the month to have been greatest on the Atlantic coast, from Massachusetts to South Carolina, in the lower lake region and in the northeastern part of the upper lake region, where the barometric means exceeded 30.05, the highest, 30.10 and 30.11, being reported from Sandy Hook, New Jersey, and New London, Connecticut, respectively To the north and east of this area of barometric maxima, the mean pressure decreased to 29.95 at Father Point, Province of Quebec; westward to the one-hundredth meridian the pressure decreased gradually to 29.9, the isobars running almost directly north and south. The lowest barometric means for the month occurred between the one hundredth and the one-hundred and fifteenth meridians, south of the fortieth parallel of latitude; Forts Apache and Grant, Arizona, reporting the lowest means, 29.74 and 29.75, respectively. Over the region between the meridians above named, and north of latitude 40°, the barometric means vary from 29.81 to 29.9, while to the westward of the one-hundred and fifteenth meridian the means were higher, as is shown by the isobar of 29.95, which is traced from the northern boundary of Washington Territory to southern California, almost parallel to the Pacific coast.

Compared with the preceding month, the mean pressure has remained unchanged over narrow areas extending from Manitoba to the Texas coast, and from southern Missouri southeastward to northern Florida. A slight decrease occurred in southern Florida and in the lower Mississippi valley; from the one-hundredth meridian to the Pacific it was also less than for May, the deficiences exceeding .05 over nearly the whole of the area named and ranging from .07 to .11 over Idaho, Montana, Utah, and Wyoming. In the south Atlantic states, and from the upper Mississippi valley eastward the mean pressure has been greater than that for May, the increase being most marked in the lake region, New England, and the middle Atlantic states, where it varied from .10 to .18.

Compared with the normal pressure for June, deficiences varying from .01 to .07 are shown in the Gulf states, northern plateau, and north Pacific coast region. In all other districts the mean pressure has been above the normal; in California, the southern plateau, Tennessee and South Carolina, the increase varied from .01 to .05; in the middle and southern slopes, Missouri and Ohio valleys, Virginia and North Carolina, from .05 to .09; and from the upper Mississippi valley eastward to the New England coast, from .10 to .16.

BAROMETRIC RANGES.

The monthly barometric ranges were greatest in New England, the maximum, .90, occurring at Portland, Maine; they were least from Arizona eastward to the Mississippi river, and in southern Florida, the smallest, .25, being reported from Fort Grant, Arizona. To the north and east of a line extending from Dakota to the south Atlantic coast, the monthly

ranges exceeded .50, while to the south and west they were less, except over portions of Idaho, Oregon, and Washington Territory, where they were from .50 to .54.

In the several districts the monthly ranges varied as follows:

New England.—From .62 on the summit of Mount Washington, New Hampshire, to .90 at Portland, Maine.

Middle Atlantic states.—From .65 at Norfolk, Virginia, to .85 at Albany, New York.

South Atlantic states.—From .44 at Jacksonville, Florida, to .69 at Kitty Hawk, North Carolina.

Florida peninsula.—From .28 at Key West, to .40 at Cedar Keys.

East Gulf states.—From .33 at New Orleans, Louisiana, to .48 at Montgomery, Alabama.

West Gulf states.—From .30 at Galveston, Texas, to .35 at Fort Smith, Arkansas.

Rio Grande valley.—From .22 at Brownsville, Texas, to .28 at Rio Grande City, Texas.

Tennessee.—From .56 at Nashville, to .59 at Chattanooga.

Ohio valley.—From .61 at Louisville, Kentucky, to .75 at Pittsburg, Pennsylvania.

Lower lake region.—From .66 at Detroit, Michigan, to .79 at Rochester, New York.

Upper lake region.—From .52 at Duluth, Minnesota, to .83 at Mackinaw City, Michigan.

Extreme northwest.—From .41 at Fort Totten, Dakota, to .53 at Saint Vincent, Minnesota.

Upper Mississippi valley.—From .48 at Saint Louis, Missouri, to .59 at La Crosse, Wisconsin.

Missouri valley.—From .46 at Leavenworth, Kansas, to .58 at Fort Bennett, Dakota.

Northern slope.—From .40 at Fort Assinaboine, Montana, to .57 at Deadwood, Dakota.

Middle slope.—From .36 at Dodge City, Kansas, to .49 on the summit of Pike's Peak, Colorado.

Southern slope.—From .28 at Fort Davis, Texas, to .34 at Fort Stockton, Texas.

Southern plateau.—From .25 at Fort Grant, Arizona, to .38 at Fort Thomas, Arizona.

Middle plateau.—.41 at Salt Lake City, Utah.

Northern plateau.—From .46 at Dayton, Washington Territory, to .54 at Lewiston, Idaho, and Spokane Falls, Washington Territory.

North Pacific coast region.—From .41 at Fort Canby, Washington Territory, to .54 at Portland, Oregon.

Middle Pacific coast region.—From .37 at Sacramento, California, to .49 at Cape Mendocino, California.

South Pacific coast region.—From .32 at Los Angeles and San Diego, California, to .40 at Yuma, Arizona.

AREAS OF HIGH BAROMETER.

Six areas of high barometer were observed within the limits of the stations of observation, or to the east of the Atlantic coast districts during the month. Two high areas approached the stations from the north of Lake Superior and moved southeastward over New England, after which they extended over the middle and south Atlantic states; two appeared northeast of New England and passed eastward without causing any marked change in the weather conditions of the United States; and the remaining two apparently resulted from a gradual increase of pressure in the southeastern portion of the United States and probably formed a part of an extended high area from the Atlantic.

I.—On the 1st of the month this area extended over the Atlantic coast districts, the barometer being .5 above the normal for the month at the extreme northeastern stations, and from .2 to .4 above the normal in the lower lake region and thence southward to the eastern Gulf states. This high area disappeared to the eastward of Novia Scotia on the 3d, in advance of a slight depression which developed off the New England coast.

II.—This area was central in North Carolina on the morning of the 3d, while there was a slight increase of pressure in the northern portion of the lake region. The barometer rose slowly in the eastern portion of the United States until the morning of the 7th, the general distribution of pressure remaining unchanged. During the 8th, the barometer fell in the eastern districts and general rains prevailed from the Mississippi river to the Atlantic coast; the rains continued in the southern and middle Atlantic states until the 15th. This area remained nearly stationary until the 8th when it apparently disappeared to the east of Cape Hatteras, North Carolina.

III.—The pressure increased at stations northeast of New England on the 11th, indicating the advance of a high area to the south and west from the North Atlantic. This increase of pressure was attended by cool easterly winds and rain on the coast north of Cape Hatteras on the 12th, when this area moved rapidly to the east followed by a disturbance in the Saint Lawrence valley.

IV.—On the morning of the 12th, the reports from stations near Lake Superior indicated the approach of a cool wave, and by the morning of the 13th the barometer had risen to 30.4 and above at stations north of the lower lakes, and cool northerly winds prevailed throughout the northern states. During the 14th and 15th this high area extended southeastward over the Saint Lawrence valley and New England, attended by light frost as far south as New Jersey. After reaching the coast the direction of movement changed to southwest and during the 16th and 17th, it moved over the south Atlantic states, losing energy and finally disappeared by a gradual decrease of pressure on the 18th.

V.—This was an area of high barometer which appeared off the New England and Middle Atlantic coasts on the 22d, and disappeared to the east without causing a marked change in the temperature or pressure at the coast stations.

VI.—This is the second well-defined area of high barometer observed during the month. It first appeared in British America, north of Minnesota, on the 24th, and moved slowly eastward over the northern stations during the 25th, 26th, 27th and 28th; on the morning of the last named date it was central near Montreal. The barometer rose to 30.3 and above at stations in New England, the lake region, and the middle states, during the transit of this area over these districts. The course continued southeastward during the 29th and 30th, and it disappeared east of Cape Hatteras, the barometer being highest at this point on the night of the 30th, with southerly winds prevailing along the Atlantic coast.

AREAS OF LOW BAROMETER.

The following table gives the latitude and longitude in which each area was first and last observed, and the average hourly velocity of movement.

Areas of low barometer.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	° ′	° ′	° ′	° ′	
No. I	45 00	94 00	42 00	91 00	12.5
II	37 00	119 00	32 00	87 00	12.0
III*	45 00	109 00	39 00	103 00	20.0
IV	42 00	107 00	40 00	101 00	18.5
V	42 00	115 00	57 00	107 00	26.5
VI	40 00	9 00	39 00	70 00	25.0
Mean hourly velocity					19.1

*United with number ii.

Six areas of low barometer, all of slight energy, have been traced on the tri-daily weather charts during the month of June, while the reports indicate the easterly movement of low areas of greater energy to the north of the United States. One depression reached the Atlantic coast; numbers ii., iii., iv., and v., apparently developed in the plateau regions and disappeared in the central valleys. As is usual during the summer months, the low areas were retarded in the mountain dis-

tricts, and generally they were limited both in number and intensity.

I.—A slight depression was central in Minnesota on the last of May. On the morning of the 1st of June this depression had moved eastward to central Wisconsin, and light showers prevailed in the upper lake region and Mississippi valley. The high area to the north of Minnesota apparently forced this disturbance to the southward during the 1st, and although well-defined as central in eastern Iowa at the morning report of the 2d, it lost energy when the area of rain extended southward over the Gulf states.

II.—This depression extended over the Rocky mountain regions on the morning of the 4th, when a barometric trough extended from British America to northern Mexico. Within this extended depression two minor depressions were observed, one central in southern Utah and the other in northern Montana. The depression traced as number ii., continued almost stationary over the southern plateau region from the 4th until the 7th, when it passed to the eastern slope of the Rocky mountains. An area of high barometer appeared to the north of the upper Missouri valley on the 8th, and the cool northerly winds from that region apparently increased this depression over the lower Missouri valley, and thence eastward during the 8th and 9th. On the morning of the 8th the barometer was low from the lower Saint Lawrence valley southwestward to Arizona, and high on the Atlantic and Gulf coasts, and in British America north of Dakota. The flow of cool air from north of the lake region resulted in general rains and strong northerly winds north of the Ohio valley and in the northwest on the 9th, as this disturbance passed eastward over the states north of the Ohio river. The barometer fell to 29.6 at Indianapolis, Indiana, at midnight of the 9th, when the centre of disturbance was near that station, and heavy rains were reported from the southern states northward to the lake region. This depression continued its easterly course until 3 p. m. of the 10th, when it moved directly south, attended by continued rains in the southern states. The barometer rose at the centre of this depression as it moved southward, and it finally disappeared by a gradual increase of pressure. The rains attending this depression continued in the southern states east of the Mississippi river until the 13th.

III.—This area formed a part of the barometric trough which extended over the Rocky mountains on the 4th, 5th, and 6th, the chief depression being central over the southern plateau region. After passing eastward to the central Missouri valley during the 5th and 6th, it apparently united with the disturbance traced as number ii., which was central in eastern Colorado at 3 p. m. of the 7th.

IV.—The morning reports of the 11th indicated that a low area was slowly forming in the Rocky mountain regions—local rains and northerly winds being reported from the northern stations, and the barometer reading below 29.7 in Colorado. The 3 p. m. report of the 11th exhibited a well-marked depression in eastern Colorado, with indications of the advance of a cool wave from north of the lake region. This disturbance moved northward from Colorado on the 11th, and finally disappeared in central Dakota on the 12th.

V.—This low area was central in northern Nevada at 11 p. m. of the 13th. The area of high barometer which extended over the regions north of Lake Superior apparently caused this depression to move northeastward over Montana, and it disappeared to the north of the Rocky mountain stations on the 14th, the barometer remaining low in the southern districts of the Rocky mountains during the greater portion of the month.

VI.—This disturbance developed in the upper Mississippi valley on the 25th, and passed directly eastward over the Ohio valley and the middle Atlantic states during the 25th and 26th. It increased in energy as it approached the coast, and the sudden and heavy rains caused much damage by floods in the middle Atlantic states and southern New England. Destructive gales also occurred on the 26th and 27th at coast stations between Cape Hatteras and New York. This disturbance passed directly eastward from the coast and was apparently prevented from following the usual northeasterly course, by the high area which extended over the region immediately to the north.

NORTH ATLANTIC STORMS DURING JUNE, 1884.

[Pressure expressed in inches and in millimetres; wind-force by scale of 0—10.

The paths of the atmospheric depressions that have appeared in the north Atlantic ocean during the month are approximately determined from reports of observations furnished by agents and captains of ocean steamships and sailing vessels, and from other miscellaneous data received at this office up to July 22, 1884.

The observations used are in general simultaneous, being taken each day at 7h. a. m. Washington, or 12h. 8m. p. m. Greenwich, mean time.

Only four depressions are charted for June, 1884; none of these exhibited any decided storm energy nor can they be identified with any of the depressions which appeared in the United States. Several slight and unimportant disturbances (not charted) appear to have moved from northern Canada over the Gulf of Saint Lawrence to the Atlantic, where they dissipated. The weather over the north Atlantic during the month may be summarized as follows: 1st to 14th, general cloudy weather, light variable airs to moderate westerly and northerly breezes; 15th to 22d, weather changeable, light to moderate breezes, variable in direction; 22d to 30th, moderate to strong southwest to northwest winds, increasing occasionally to moderate gales; weather overcast and rainy. (The heavy northeasterly gales which prevailed on the Atlantic coast, between Cape Hatteras and Sandy Hook during the 26th, 27th, and 28th, occurred in connection with low area vi. and high area vi., and are referred to under the respective headings.) Frequent and dense fogs prevailed over the region west of the fortieth meridian from the 1st to 25th.

The following descriptions refer to the depressions charted:

1.—This disturbance was first noticed by the s. s. "Strassburg," H. Heineke, commanding. On the 2d, that vessel, in N. 39° 7′, W. 65° 16′, had barometer 29.84 (757.9), a fall of about .4 inch during the previous twenty-four hours; on the 1st the wind was n. and nw., force 7 to 8, changing on the 2d to ssw. and sw., force 7 to 8. On the same date the s. s. "Noordland," in N. 40° 8′, W. 63° 28′, had a fresh ne. to se. gale, with rainy weather. By the 3d the disturbance had moved northward and was central south of Nova Scotia, the lowest reported pressure being about 29.85 (758.2). During the day it apparently moved northward or northwestward over the maritime provinces and disappeared in the Gulf of Saint Lawrence on the 4th.

2.—This disturbance appeared near N. 47°, W. 39°, on the 8th; on that date the s. s. "Wieland," C. Hebich, commanding, reported in N. 46° 47′, W. 38° 10′, barometer 29.75 (755.6), wind ssw., force 4. Vessels to the westward of W. 40°, had moderate westerly and northwesterly winds, while those to the eastward, between W. 40° and 30°, had moderate southerly winds. By the 9th the depression had moved north-northeastward to about N. 55°, W. 29°; the s. s. "Lake Huron," W. Bernson, commanding, in N. 53° 40′, W. 29° 54′, reported barometer 29.53 (750.0), wind wnw., force 7; heavy sea and cloudy. Over the region south of the fiftieth parallel the pressure was 30.0 (762.0) and above; during the 9th, another depression, (not charted), appears to have moved eastward north of the fiftieth parallel, as indicated by the following report: barkentine "Corisande," D. Thoms, commanding; "at 10 p. m., Greenwich time, on the 9th, in N. 52° 25′, W. 42° 50′, the wind, which was ssw., increased to a moderate gale and veered to w., barometer reading 29.5 (749.3). On the 10th, in N. 53° 25′, W. 39° 17′, the barometer read 29.58 (751.3), wind w., force 6, heavy sea and cloudy weather." During the day, both depressions disappeared beyond the limits of observation.

3.—This disturbance appeared in the Gulf of Saint Law-